

The genus *Teinobasis* on the Bird's Head Peninsula and the Raja Ampat Islands, Indonesia (Odonata: Coenagrionidae)

Günther Theischinger¹ & Vincent J. Kalkman²

¹Water Science, Office of Environment and Heritage, NSW Department of Planning and Environment, PO Box 29, Lidcombe, NSW 1825, Australia; gunther.theischinger@environment.nsw.gov.au

²Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA, Leiden, The Netherlands

Received 30th April 2014; reviewed and accepted 26th August 2014

Abstract. An overview of the genus *Teinobasis* on the Bird's Head Peninsula and the Raja Ampat Islands in Indonesia is given. Four new species, *T. aquila*, *T. lieftincki*, *T. michalskii*, and *T. splendens*, are described from the area and one probably new species is described but left unnamed. New material of six other species, *T. buwaldai*, *T. pretiosa*, *T. pulverulenta*, *T. rufithorax*, *T. cf. superba*, and *T. wallacei*, is brought on record. A key to the males of the twelve species known from the region is included and colour illustrations of males of eight species and females of five species are given.

Key words. Dragonfly, damselfly, Zygoptera, New Guinea, West Papua.

Introduction

The genus *Teinobasis* Kirby, 1890 currently includes over seventy species found from Peninsular Malaysia and the Philippines in the west to the Solomon Islands in the east. The species are largely confined to tropical forest, generally favouring standing or slowly flowing water and often marshy habitats. Many of the species have small ranges and are inconspicuous, making it likely that several dozens of species remain to be discovered. It seems likely that further study will show that the genus can be divided into several monophyletic groups. New Guinea and its adjacent islands (excluding the Solomon Islands) seems to be a hotspot for *Teinobasis* with 29 species described to date. Although Australia and New Guinea share relatively many coenagrionids, this is not the case for the genus *Teinobasis* with only the relatively widespread *T. rufithorax* (Selys, 1877) reaching the tropical northeast of Australia (KALKMAN & ORR 2012). The known spe-

cies occurring in New Guinea, Sulawesi and the Moluccas can be identified with MICHALSKI (2012) while KALKMAN & ORR (2013) give colour illustrations and a key for all species occurring in the north of New Guinea. The current paper provides an overview of the genus on the Bird's Head (Vogelkop) Peninsula and the Raja Ampat Islands and describes four new species bringing the total for the peninsula to twelve. In addition we list new distribution records for six species. Almost all material discussed was collected in 1948 by M.A. Lieftinck during the Swedish-Netherlands Expedition also known as the Bergman Expedition. This expedition visited the Raja Ampat Islands (including Misool, Salawati, Batanta and Waigeo), the Sorong region and parts of the south coast of the Bird's Head Peninsula (FRODIN 2007). Although the expedition lasted from 1948 to 1949 Lieftinck only participated for four months. Part of the material he collected was worked on and published by himself in the period 1951–1960 and was used by other workers (WATSON 1967; GASSMANN 1999, 2000; VAN TOL 2007). A significant portion of the material was however not listed in publications although Lieftinck seems to have used it for his checklist of the Papuan region (LIEFTINCK 1949). Lieftinck did work on the material of *Teinobasis* from the Bird's Head Peninsula but only identified *T. wallacei* Campion, 1924 and *T. rufithorax* and labelled the remaining species only with letter codes.

Material and methods

Unless otherwise noted all material listed was collected by M.A. Lieftinck and is lodged in the collection of the Naturalis Biodiversity Center, Leiden, The Netherlands (RMNH). The description of the new species is based on the holotype only, information on variability if available is provided subsequent to the description.

Teinobasis aquila sp. nov.

(Figs 1–8, 36a)

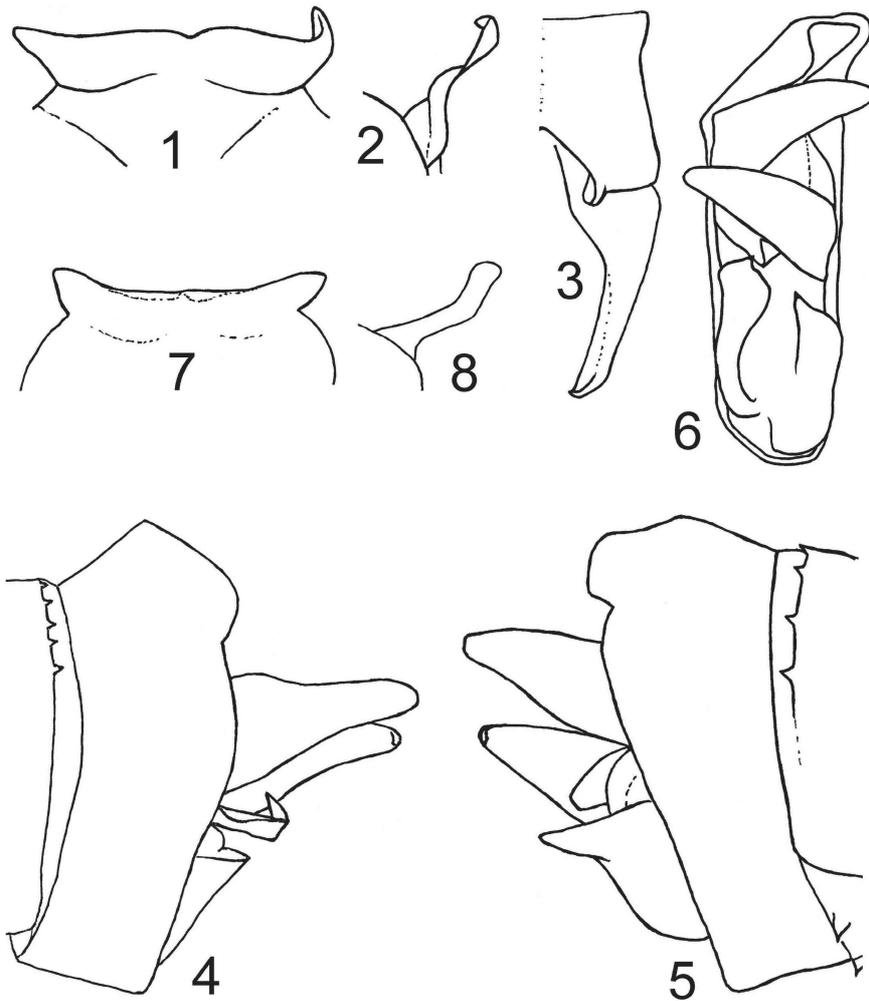
Material studied

Holotype ♂. Indonesia, Papua Barat, Bird's Head Peninsula, Klamono Oil-fields, 18–24-viii-1948, M.A. Lieftinck (RMNH).

Paratypes. 1♂ 2♀, same data as holotype (RMNH).

Etymology

The specific name *aquila* (Latin for eagle), a noun in apposition, refers to the posterior lobe of the pronotum which is winged in both sexes.



Figures 1–8. *Teinobasis aquila* sp. nov., Figs 1–6 male, Figs 7–8 female: (1–2) posterior lobe of pronotum in dorsal and lateral view; (3–6) anal appendages in dorsal (half), lateral (left, right) and caudal view; (7–8) posterior lobe of pronotum in dorsal and lateral view.

Male (Figs 1–6, 36a)

Head – Labium including palps cream to pale yellow; remainder of head largely black with cream to pale yellow markings confined to labrum, which has a tiny basal dark spot either side, anteclypeus, much of anterior frons (pale bar medially interrupted), genae, mandibles (except tips), outer face of antennal bases and membrane on top of scape.

Prothorax – Pale orange except for anterior rim of anterior lobe and almost all of posterior section of posterior lobe of pronotum which are slightly to strongly darkened greyish brown. Posterior lobe of pronotum with base moderately wide and posteriorly with lateral subtriangular flanges (Figs 1, 2).

Synthorax – Anteriorly dark brown, probably shining black in life, this colour extending slightly beyond humeral suture into antero-ventral quarter of mesepimeron, whereas the orange of the posterior pleura scarcely reaches into mesepisternum at its postero-dorsal and postero-ventral corners; antealar sinus yellow; two spots along subalar ridge, a dorsal spot at about $\frac{1}{8}$ length from dorsal end of metathoracic suture and dorsal margin of metapostepimeron black or at least dark. Legs pale orange with tip of femora, base and tip of tibiae and part of tarsal segments darkened; claws brown. Postcoxae and poststernum cream to pale orange. Wing membrane hyaline, venation greyish brown to black; $12-13/12$ Px; discoidal cell ratio anterior side to posterior side, ca $\frac{1}{2}$ in Fw ca $\frac{2}{3}$ in Hw; pterostigma distinctly longer than wide, blackish grey, margined whitish, opposing sides subequal in length.

Abdomen – S1 yellow to pale orange with only apical margin dark, widest mid-dorsally; S2 dorsally very dark, laterally dull yellow; S3–S9 dorsally and laterally mainly very dark with latero-ventral edge dull yellow to pale orange; a pale basal patch each side of midline (S3) or a slight indication of a pale basal patch (S4–S7); intersegmental membrane of S8 and S9 dull pale orange; S10 dorsally and laterally black, ventrally pale. Anal appendages greyish orange to brown; superiors arched and hooked, upper branch with base wide, unarmed and with inner margin smooth, lower branch shorter

than upper branch, slightly curved and appearing narrowly leaf-shaped; inferior appendages nearly half as long as superiors (Figs 3–6).

Measurements [mm] – Hw 24.6; abdomen (including anal appendages) 39.3.

Female (Figs 7, 8)

Head – Much as in male but: Pale frontal bar narrowly but distinctly interrupted medially.

Prothorax – Colouration similar to male. Posterior lobe of pronotum bearing similar processes (Figs 7, 8) to male.

Synthorax – Similar to male but: Dark area on mesepimeron more extensive and dark and pale areas generally less strongly differentiated from each other, but gradually merging. Px 12–13/13.

Abdomen – Colouration much as in male but in general somewhat paler. Sides of S9 and ventral face of S10 merging into dull brownish yellow. Valves dull yellow, reaching backward slightly beyond tips of anal appendages.

Measurements [mm] – Hw 26.2; abdomen 42.0.

Variability

The paratype male has 13–15/12 Px but otherwise conforms well with the holotype. Its measurements are: Hw 24.5 mm; abdomen plus anal appendages 39.0 mm.

Differential diagnosis

Teinobasis aquila stands out from the other orange *Teinobasis* species described from New Guinea by the distinctly winged posterior lobe of the pronotum in both sexes (Figs 1, 2, 7, 8), a character which is only shared with the male of *T. lieftincki* sp. nov. The almost completely pale labrum of both sexes and the unarmed upper branch of the superior anal appendages of the male (Figs 3–6) clearly distinguish *T. aquila* from the sometimes syntopic *T. lieftincki* sp. nov. (Figs 10–12).

***Teinobasis lieftincki* sp. nov.**

(Figs 9–14, 36c, d)

Material studied**Holotype** ♂. Indonesia, Papua Barat, Bird's Head Peninsula, Klamono Oil-fields, 18–24-viii-1948, M.A. Lieftinck (RMNH).**Paratypes.** 1♂, 1♀, same data as holotype (RMNH).**Etymology**

The specific epithet is a noun in the genitive case, dedicated to its collector M.A. Lieftinck, the father of Papuan odonatology.

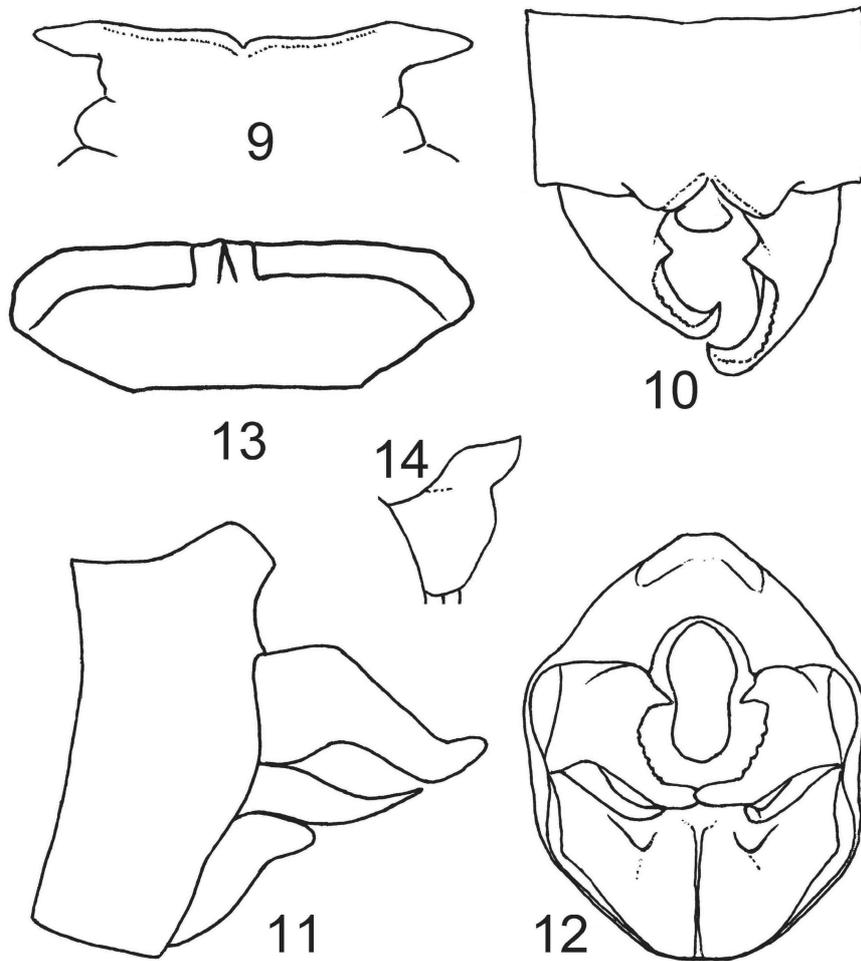
Male (Figs 9-12, 36c)

Head – Labium including palps cream to pale yellow; remainder of head largely black with slightly more than anterior $\frac{1}{3}$ of labrum, anteclypeus, most of anterior frons, genae, mandibles (except tips), outer face of antennal bases and membrane on top of scape cream to pale yellow.

Prothorax – Pale orange except for anterior rim of anterior lobe and posterior section of posterior lobe of pronotum which merge diffusely into greyish brown. Posterior lobe of pronotum with base moderately wide and posteriorly with lateral subtriangular wings (Fig. 9).

Synthorax – Front shining black, this slightly extending over mesothoracic suture at antero-ventral corner of mesepimeron, whereas the orange of the other pleura slightly extends into mesepisternum at its postero-dorsal and postero-ventral corners; antealar sinus yellow; antealar ridge, three spots along subalar ridge, a dorsal spot at about $\frac{1}{8}$ length from dorsal end of metathoracic suture and dorsal margin of metapostepimeron black or at least dark. Legs pale orange with tip of femora, base and tip of tibiae and part of tarsal segments blackened/darkened; claws brown. Postcoxae and poststernum cream to pale orange. Wing membrane hyaline, venation greyish brown to black; 15–16/15 postnodals; discoidal cell in Fw with anterior side approximately $\frac{1}{3}$ as long as posterior side, in Hw approximately $\frac{1}{2}$ as long; pterostigma slightly longer than wide, blackish grey with whitish margin, costal side slightly shorter than subcostal side, proximal and distal side subequal in length.

Abdomen – S1 yellow to pale orange with only apical margin darkened, widest mid-dorsally; S2 dorsally very dark/black, laterally dull yellow; S3–S9 dorsally and laterally largely very dark with latero-ventral edge dull yellow to pale orange; a pale basal patch each side of midline (S3) or hardly



Figures 9–14. *Teinobasis lieftincki* sp. nov., Figs 9–12 male, Figs 13–14 female: (9) posterior lobe of pronotum, dorsal; (10–12) anal appendages in dorsal, lateral and caudal view; (13–14) posterior lobe of pronotum in dorsal and lateral view.

an indication of a pale basal patch (S4–S7); intersegmental membrane of S8 and S9 dull pale orange; S10 black. Anal appendages greyish orange to brown; superiors in profile with dog-leg bend and hooked inward as seen in dorsal and posterior view; upper branch with wide base, armed with inner tooth at about $\frac{1}{3}$ length, inner margin of narrow apical section crenulated; lower branch markedly shorter than upper branch, slightly curved and appearing pointed; inferior appendages squat, simple, less than half as long as superiors (Figs 10–12).

Measurements [mm] – Hw 25.8; abdomen (including anal appendages) 40.6.

Female (Figs 13–14, 36d)

Head – Much as in male.

Prothorax – Colouration much as in male. Posterior lobe of pronotum thickened in basal ca $\frac{2}{3}$ and postero-medially elevated into a small squarish area that is topped by an ad-pressed spine along its mid-line (Figs 13, 14).

Synthorax – Much as in male but: Dark area on mesepimeron more extensive; dark and pale areas less strongly differentiated from each other and merging into each other more gradually. Postnodals 16/15; pterostigma slightly paler than in male, with costal and subcostal side more subequal; discoidal cell of both wings with anterior side slightly longer as compared to posterior side than in male.

Abdomen – Colouration much as in male but in general somewhat paler. Sides of S9 and ventral face of S10 merging into dull brownish yellow. Valves dull yellow, reaching backward as far as anal appendages.

Measurements [mm] – Hw 29.9; abdomen 42.0.

Variability

The paratype male has 15/14 Px but otherwise conforms well with the holotype. Its measurements are: Hw 28.1 mm; abdomen plus anal appendages 43.8 mm.

Differential diagnosis

The basally strongly armed upper branch of the male superior anal appendages (Figs 10–12) is unique in *Teinobasis* from New Guinea. *Teinobasis lieftincki* sp. nov. appears closest to the other orange species from the area with a more apically armed upper branch of the superior anal appendages. They are *T. prothoracica* (Selys, 1877), *T. dolabrata* Lieftinck, 1938 and the species listed in this paper as *T. cf. prothoracica*. The largely dark labrum and the absence of lateral processes on the posterior lobe of the pronotum (Figs 13, 14) distinguish the female of *T. lieftincki* from the sometimes syntopic *T. aquila* sp. nov. (Figs 7, 8).

***Teinobasis michalskii* sp. nov.**

(Figs 15–22, 38c–e)

Material studied

Holotype ♂. Indonesia, Papua Barat, Bird's Head Peninsula, Sorong, 28-viii-06-ix-1948, M.A. Lieftinck (RMNH).

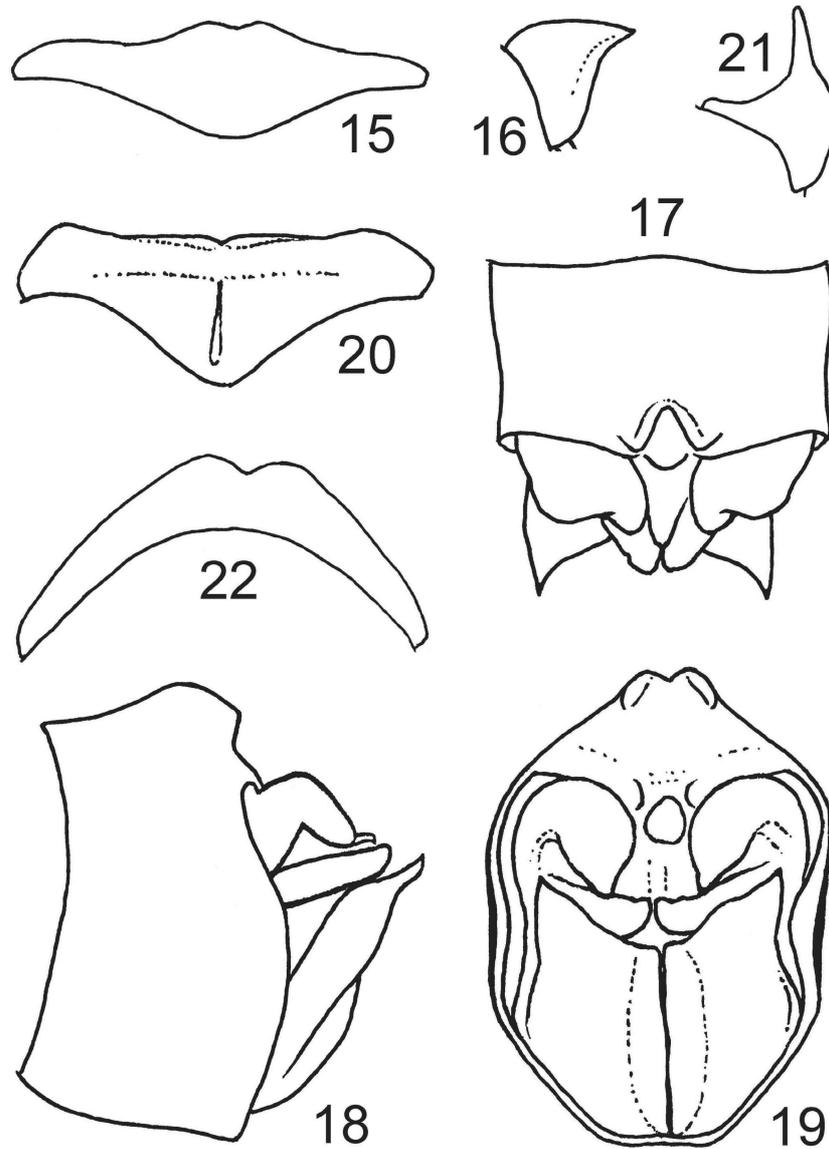
Paratypes (all Indonesia, Papua Barat, Bird's Head Peninsula). 19♂, 7♀, Sorong, 28-viii-06-ix-1948; 5♂, 1♀, Sorong, 24-31-x-1948; 54♂, 11♀, Klamono Oilfields, 18-24-viii-1948; 7♂ Misool, 0-75 m, 08-ix-20-x-1948; M.A. Lieftinck (RMNH).

Etymology

The specific epithet is a noun in the genitive case, dedicated to John Michalski for his effort of combining all previously published information on Papuan odonates into one concise manual.

Male (Figs 15–19, 38d)

Head – Labium including palps cream to pale yellow; labrum pale blue with ill-defined black medio-basal line ending in circular spot and narrow black lines along latero-basal margin; anteclypeus, much of anterior frons, genae, most of mandibles and basal segments of antennae pale to dull blue; postgenae bluish to yellowish anteriorly, black posteriorly; postclypeus, most of antennae and top of head shining black.



Figures 15–22. *Teinobasis michalskii* sp. nov., Figs 15–19 male, Figs 20–22 female: (15–16) posterior lobe of pronotum in dorsal and lateral view; (17–19) anal appendages in dorsal, lateral and caudal view; (20–22) posterior lobe of pronotum in dorsal, lateral and caudal view.

Prothorax – Anterior lobe of pronotum largely yellowish brown, median and posterior lobe black; pleura pale yellow. Posterior lobe of pronotum simply convex to very slightly bilobed (Figs 15, 16).

Synthorax – Front shining black; sides largely cream to pale yellow but most of metepimeron brown, topped with two shining black patches; a subtriangular patch in antero-dorsal corner of metepisternum and a stripe along approximately $\frac{1}{6}$ of metapleural suture, two spots along subalar ridge and dorsal margin of metapostepimeron shining black. Postcoxae and poststernum pale cream to pale yellow. Coxae and trochanters pale yellow to cream; femora and tibiae pale to dull yellow with outer face of femora and all of inner and part of outer face of tibiae lined with black; also black apex of femora and base and apex of tibiae; tarsal segments and claws and all spines brown to black. Wing membrane hyaline, venation dark greyish brown to black; postnodals 14/14; anterior side of discoidal cell of Fw approximately $\frac{1}{3}$, of Hw $\frac{1}{2}$ – near $\frac{2}{3}$ as long as posterior side; pterostigma rhomboidal, about as long as wide, brownish grey with narrow cream margin.

Abdomen – Long and slender, largely shining black; sides of S1 and S2 largely pale to dull yellow, also a small basal spot each side of midline and latero-ventral margin of S3–S7, and antero-lateral $\frac{3}{4}$ of S8 and S9. Anal appendages yellowish to blackish brown; upper branch of superiors shorter than lower branch, strongly bent downwards, produced on inner side and with elongate narrow hook; inferiors considerably longer than superiors, terminating in a thin point (Figs 17–19).

Measurements [mm] – Hw 22.2; abdomen (including anal appendages) 38.3.

Female (Figs 20–22, 38e)

Head – Much as in male but: Dark areas paler (brown) and pale areas darker (brownish yellow to brownish grey); pattern therefore less sharply defined or indiscernible, particularly on labrum.

Prothorax – Much as in male but: Pronotum variously brown; posterior lobe somewhat elevated and bilobed (Figs 20–22).

Synthorax – Much as in male but: Pale colouration (brownish yellow) more extensive, starting from posterior third of mesepisternum.

Abdomen – Much as in male but: S1–S7 brown rather than shining black and S8 with black stripe along mid-line. Sternite 8 and valves cream to pale yellow.

Measurements [mm] – Hw 22.3; abdomen 34.3.

Variability

The holotype and described paratype female are apparently rather pale specimens. Many other specimens are somewhat to markedly darker (Fig. 38c). In the darkest specimens there is often some degree of pruinescence evident, particularly on the postgenae, metapostepimeron, coxae, postcoxae, and abdomen. There is a bluish tinge on the labium and the pale areas on head, thorax, and abdomen are often more bluish or bright, even almost dark blue. The pattern of the labrum is more clearly defined with the dark basal spot smaller, and the dark lines along latero-basal margin wider, often subtriangular. The anterior frons may be completely dark to almost black. The dark on the front of the synthorax continues into the mesokatepisternum and mesepimeron and the dark patches on metepisternum are connected forming kind of a reversed U-mark. The tibiae of the first two pairs of legs are distinctly darker. The basal pale spots on S4–S7 are almost or completely lacking and particularly S8, even S9 can appear almost black instead of largely blue. The number of postnodals varies (13–15/12–15). Measurements [mm], male: Hw 20.0–22.6; abdomen plus anal appendages 34.5–38.0; female: Hw 20.7–23.6; abdomen 30.8–35.8.

Differential diagnosis

The male of *Teinobasis michalskii* sp. nov. has the upper branch of the superior anal appendages shorter than the lower branch, abruptly bent and much shorter than the inferior appendages (Figs 17–19). Several described species, in particular *T. scintillans* Lieftinck, 1932, *T. stigmatizans* Lieftinck, 1938 and *T. debeauforti* Lieftinck, 1938, share some of these characters, but the shape of the inferior appendages of *T. michalskii* (Figs 17–19) comes

closer to *T. alternans* Liefstinck, 1935, a species with very short upper branch of the superior appendages. As opposed to *T. stigmatizans* and *T. debeauforti*, the inner side of the upper branch of the superior appendages is produced and in addition there is a narrow but substantial hook-like appendix in *T. michalskii* (Fig. 18). In *T. scintillans* the lower branch of the superior anal appendages is much longer than in *T. michalskii*, but the upper branch is not so abruptly down-turned. This seems to be diagnostic for the male as is the steep bilobed posterior lobe of the pronotum in the female.

***Teinobasis splendens* sp. nov.**

(Figs 23–30, 37d, e)

Material studied

Holotype ♂. Indonesia, Papua Barat, Bird's Head Peninsula, Klamono Oilfields, 18–24-viii-1948, M.A. Liefstinck (RMNH).

Paratype. 1 ♀, same data as holotype (RMNH).

Etymology

The specific name *splendens* (present participle of *splendere*, the Latin verb for shine) refers to the largely metallic colouration of the body.

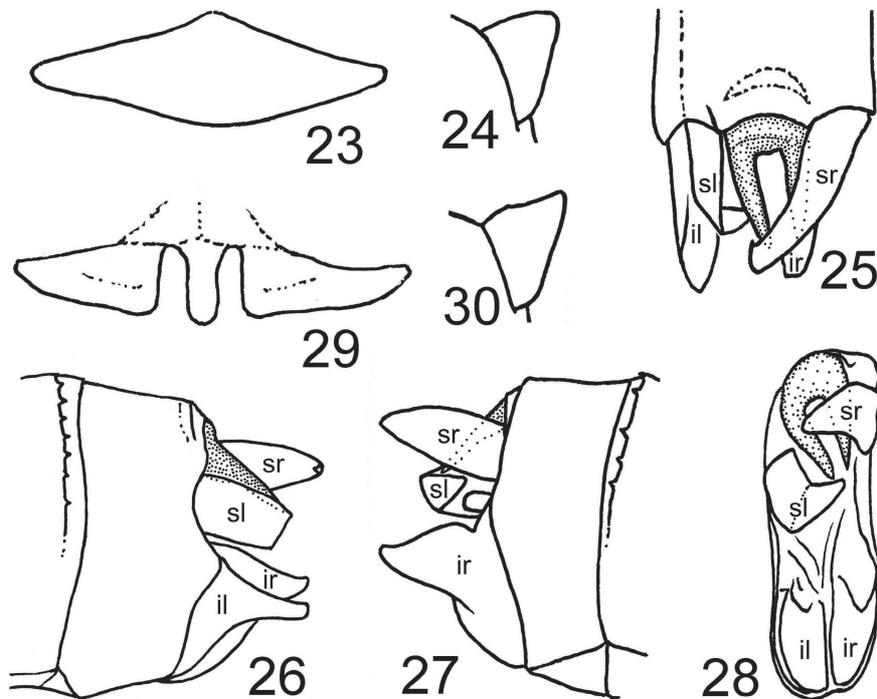
Male (Figs 23–28, 37d)

Head – Labium including palps cream to pale yellow; labrum brown to blackish brown merging into brownish yellow in anterior third; anteclypeus, genae, mandible bases and a bar across anterior frons yellow to cream; inner face of scape and pedicel and all of remaining antennal segments brown to black, outer face of scape and pedicel dull greyish to yellowish; postclypeus and top of head metallic black; subgenae largely brown to black, anteriorly cream.

Prothorax – All lobes of pronotum brown to black merging into yellowish brown to brownish yellow on pleura. Posterior lobe simple, posteriorly convex (Figs 23, 24).

Synthorax – Front, mesepimeron and approximately anterior half of metepisternum metallic brownish black, this continuing into, or almost isolated from, a small dorsal patch crossing metathoracic suture, and also continuing along subalar ridge into posterior margin of metapostepimeron; poste-

rior half of metepisternum, most of metepimeron, postcoxae and postster-
num brownish yellow to cream. Coxae and trochanters pale cream; remain-
der of legs largely pale cream with knees, apex of tibiae, claws, all spines
and much of tarsal segments brown to black; upper face of femora narrowly
lined with brown. Wing membrane hyaline, venation brown to black. Post-
nodals 12–13/12; discoidal cell of Fw with anterior border approximately
 $\frac{1}{3}$, of Hw approximately $\frac{1}{2}$ as long as posterior border; pterostigma small,
greyish brown, narrowly bordered with cream.



Figures 23–30. *Teinobasis splendens* sp. nov., Figs 23–28 male, Figs 29–30 female: (23–24) posterior lobe of pronotum in dorsal and lateral view; (25–28) anal appendages in dorsal, lateral (left, right) and caudal view; (29–30) posterior lobe of pronotum in dorsal and lateral view. Segment 10 and the anal appendages of the unique male of *T. splendens* are clearly distorted with the left superior appendage (sl) strongly bent of and much of the left inferior (il) markedly depressed. For more clarification the appendages are marked with sl, sr, il, and ir, and what is detectable of the dorsal appendix of S10 is stippled (Figs 25–28).

Abdomen – Long and slender, largely metallic brown to black with patches of cream as follows: S1 with large lateral patch; S2 with tiny basal and large lateral patch adjacent to secondary genitalia; S3–S7 with tiny basal spot each side of midline and narrow latero-ventral margin; S8 and S9 with large patch each side, broadly separated mid-dorsally and elongate in shape and confluent with pale latero-ventral edge in S8, squarish in shape and narrowly separated mid-dorsally and partly laterally from pale latero-ventral edge in S9. Anal appendages brown to black, upper branch of superiors about as long as, or slightly longer than inferiors; lower branch of superiors shorter, possibly finger-shaped; dorsal appendix a U-shaped fork. Segment 10 and the anal appendages of the unique specimen are clearly distorted with the left superior appendage (sl) strongly bent of and much of the left inferior (il) markedly depressed. For more clarification the appendages are marked with sl, sr, il, and ir, and what is detectable of the dorsal appendix of S10 is stippled (Figs 25–28).

Measurements [mm] – Hw 19.8; abdomen (including anal appendages) 32.3.

Female (Figs 29–30, 37e)

Head – Much as in male but: Labrum brown to black only in basal half along midline and along lateral margins, remainder merging into greyish to dull yellow.

Prothorax – Much as in male but: Approximately more than posterior half of posterior lobe of pronotum subdivided into a narrow tongue-shaped median lobe and a subtriangular lobe each side (Figs 29–30).

Synthorax – Much as in male but: Mesepimeron only brown and dark (brown) area on metepisternum reduced to dorsal fifth, whereas a black spot on metathoracic suture and the black margin of metakatepimeron are clearly separated. Postnodals 12/11; pterostigma somewhat darker with pale margin less distinct and narrower.

Abdomen – Much as in male but: Pale patches each side of S9 ill-defined, darker, much more widely separated mid-dorsally and hardly connected

with pale lateral edge. Anal appendages and paraprocts black. Sternite 8 cream to pale yellow; valves narrowly dark at base, otherwise cream to pale yellow, reaching backward as far as tips of anal appendages.

Measurements [mm] – Hw 20.8; abdomen 30.2.

Differential diagnosis

The structure and proportion of the male terminalia in *Teinobasis splendens* sp. nov. (Figs 25–28) are most similar to *T. serena* Lieftinck, 1932. Also similar but somewhat narrower is the U-shaped dorsal appendix of S10 (Figs 25, 28). Whereas in *T. splendens* front and sides of the synthorax are shining black/dark beyond the intersegmental suture, this coloration is restricted to only parts of the front of synthorax in both subspecies of *T. serena*. *Teinobasis metallica* (Förster, 1898) and *T. pretiosa* (Selys, 1877), both more remotely similar to *T. splendens* in structure, have the dark area on the synthorax more restricted and much darker legs. The species seems most closely related to *T. pulverulenta* Ris, 1915 but the male of this species has the dorsal appendix of S10 shaped like a bull's head with the horns directed obliquely outward and bowed, whereas it is U-shaped with the branches parallel and straight in *T. splendens*. Furthermore, based on the description by Ris (1915), the female of *T. pulverulenta* has the posterior lobe of the pronotum undivided while that of *T. splendens* is subdivided into a narrow tongue-shaped median lobe flanked by two subtriangular lobes.

***Teinobasis* species cf. *prothoracica* (Selys, 1877)**

(Figs 31–35, 36b)

Material studied

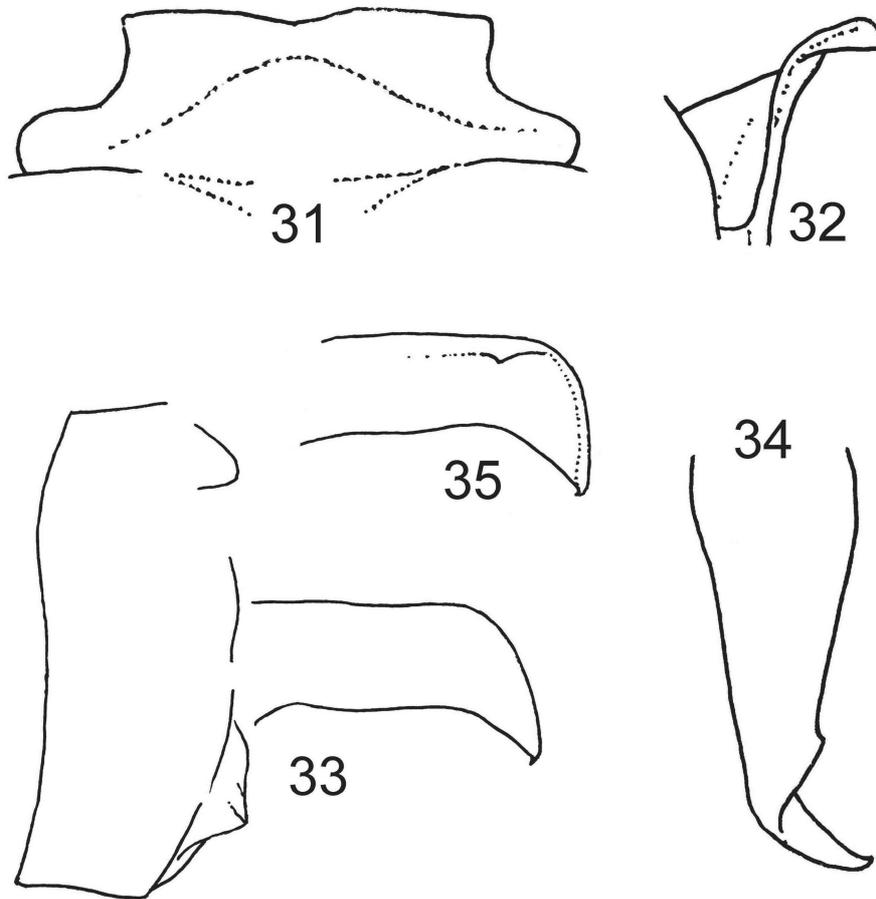
1♂, Indonesia, Papua Barat, Bird's Head Peninsula, Klamono Oilfields, 18–24-viii-1948, M.A. Lieftinck (RMNH).

Male (Figs 31–35, 36b)

Head – Labium including palps cream to pale yellow; remainder of head largely shining black with cream to pale yellow marking as follows: all of labrum except for a medial spot and lateral margins in basal half, anteclypeus, a medially interrupted bar across anterior frons, genae, mandibles (except

tips), outer face of antennal bases, scape and pedicel and membrane on top of scape.

Prothorax – Pale orange except slightly darkened anterior lobe and with much of posterior lobe of pronotum greyish brown to black. Posterior lobe of pronotum with base rather wide, topped by short, moderately wide rectangular flap (Figs 31, 32).



Figures 31–35. *Teinobasis* cf. *prothoracica*, male: (31–32) posterior lobe of pronotum in dorsal and lateral view; (33) anal appendages, lateral view; (34–35) upper branch of superior appendages in dorsal and lateral view.

Synthorax – Front shining black, this slightly overlapping humeral suture at about $\frac{1}{3}$ length of mesepimeron, whereas the orange of the other pleura extends slightly into mesepisternum at its postero-dorsal and postero-ventral corners; antalar sinus yellow; antalar ridge, most of subalar ridge, particularly two spots along it, and dorsal margin of metapostepimeron black or at least dark. Legs pale orange with tip of femora, base and tip of tibiae and part of tarsal segments blackened/darkened; claws dark reddish brown. Postcoxae and poststernum cream to pale orange. Wing membrane hyaline, venation greyish brown to black; 13/11–12 postnodals; discoidal cell of Fw with anterior side slightly less than $\frac{1}{2}$, of Hw slightly more than $\frac{1}{2}$ as long as posterior side; pterostigma slightly longer than wide, blackish grey, margined whitish, costal side slightly shorter than subcostal side, proximal and distal side subequal in length.

Abdomen – S1 yellow to pale orange with only apical margin, widest mid-dorsally, black; S2 dorsally shining black, laterally dull yellow; S3–S7 dorsally and laterally largely shining black with latero-ventral edge dull yellow to pale orange; a pale basal patch each side of midline (S3) or hardly an indication of a pale patch (S4–S7); S8 and S9 largely black, postero-lateral corner of S8 and ventral and much of posterior margin of S9 orange; intersegmental membrane of S8 and S9 dull pale orange; S10 shining black, ventrally somewhat paler. Anal appendages greyish orange to brown; upper branch of superiors with apical $\frac{1}{3}$ strongly curved ventrally and apex hooked, a small inner tooth at about $\frac{2}{3}$ length; lower branch missing in the available specimen; inferior appendages strongly damaged, apparently very short (Figs 33–35).

Measurements [mm] – Hw 25.2; abdomen (including anal appendages) 42.2.

Female

Unknown.

Differential diagnosis

From what is left of the terminalia of the unique male of *Teinobasis* cf. *prothoracica*, it is evident that the upper branch of the superior anal appendages

is wider and more curved (Figs 33–35) than in *T. prothoracica* (Selys, 1877) and apically much less expanded than in *T. dolabrata* Lieftinck, 1938. The small inner tooth of the upper branch of the male superior anal appendages in *T. cf. prothoracica* (Figs 34, 35) is markedly closer to the apex than in both *T. prothoracica* and *T. dolabrata*.

Remarks on previously described species

***Teinobasis buwaldai* Lieftinck, 1949** (Figs 38a, b)

Material studied

Indonesia, Papua Barat, Bird's Head Peninsula: 2♂, 4♀, Klamono Oilfields, 18–24-viii-1948. Papua New Guinea, Gulf Province: 1♂, Dark-End Lumber, lowland forest, x-1999.

Teinobasis buwaldai was previously only known from Aru Islands. The species closely resembles *T. laglaizei* (Selys, 1878), described from Karoon, which refers to a wider area around Manokwari in the northeast of the Bird's Head, and which was later found at several localities in the surrounding of Jayapura. When describing *T. buwaldai*, LIEFTINCK (1949) doubted whether or not it should be described as a full species or as subspecies of *T. laglaizei*; the two species are evidently very closely related and can be separated only with reference to the male appendages. The new records presented here show that *T. buwaldai* has a wide range including the southern lowland of New Guinea, the Aru Islands and parts of the Bird's Head Peninsula.

***Teinobasis pulverulenta* Ris, 1915** (Fig. 37c)

Material studied (all from Indonesia, Papua Barat, Bird's Head Peninsula)

5♂, Sorong, 28-viii-06-ix-1948; 7♂, Sorong, 24–31-x-1948.

The records of *T. pulverulenta* were thus far restricted to the Indonesian part of the lowlands of southern New Guinea, where it was found over a wide area: Kaimana, Katan, Vriendschap, and Najaja (RIS 1915; LIEFTINCK 1949; KAIZE & KALKMAN 2011). The locality Najaja could not be identified but tracing the journey of E. Lundqvist, the collector of the material, this locality must be somewhere on the coast of the southern lowlands of New Guinea near the Namaripi river (Kabupaten Mimika). The occurrence of *T. pulverulenta* at Sorong means a large expansion of its range.

***Teinobasis rufithorax* (Selys, 1877)**

Material studied (all from Indonesia, Papua Barat, Bird's Head Peninsula) 1♂, Salawati, Solol, north coast, 5-viii-1948; 21♂, 5♀, Sorong, 08-vii-14-viii-1948; 6♂, Misool, 0-75 m, 08-ix-20-x-1948; 1♀, Klamono Oilfields, 18-24-viii-1948; 8♂, 2♀, Sorong, 28-viii-06-ix-1948.

Teinobasis rufithorax is the most widespread of the Papuan species of the genus, ranging from the Moluccas to the Solomon Islands and northeastern Queensland, Australia. It often occurs in degraded forest close to the sea and seems, in comparison with other species of *Teinobasis*, well capable of dispersal over expanses of sea.

***Teinobasis* species cf. *superba* (Hagen in Selys, 1877)** (Figs 37a, b)

Material studied (all from Indonesia, Papua Barat, Bird's Head Peninsula) 2♂, Misool, 0-75 m, 08-ix-20-x-1948; 8♂, 5♀, Sorong, 24-31-x-1948.

These specimens are close to *T. superba*, a species known from Sulawesi and the Moluccas. A large collection of *Teinobasis* specimens from Sulawesi, including several new species and additional material of *T. superba*, is housed in the RMNH. A study of that material is needed to determine if the specimens from Misool and Sorong are conspecific with *T. superba* from Sulawesi.

***Teinobasis wallacei* Champion, 1924**

Material studied (all from Indonesia, Papua Barat, Bird's Head Peninsula) 2♂, 5♀, Sorong, 08-vii-14-viii-1948; 1♂, 4♀, Klamono Oilfields, 18-24-viii-1948; 63♂, 66♀, Sorong, 28-viii-06-ix-1948; 5♂, 2♀, Misool, 0-75 m, 08-ix-20-x-1948; 1♂, 2♀, Sorong, 24-31-x-1948.

The material of *T. wallacei* was previously studied by Lieftinck but the results were not published. Hitherto it was only known from the male holotype from the »northwest end of New Guinea«.

***Teinobasis pretiosa* (Selys, 1877)**

In the original description the holotype of *T. pretiosa* was erroneously stated to come from Mysol which was corrected by LIEFTINCK (1935) to »Korrido on Soepiori« (Supiori Island). Probably in error he mentioned the species for the Vogelkop (Bird's Head) Peninsula in his catalogue of the Odonata of the Papuan region (LIEFTINCK 1949). There are no validated records for the Bird's Head Peninsula.

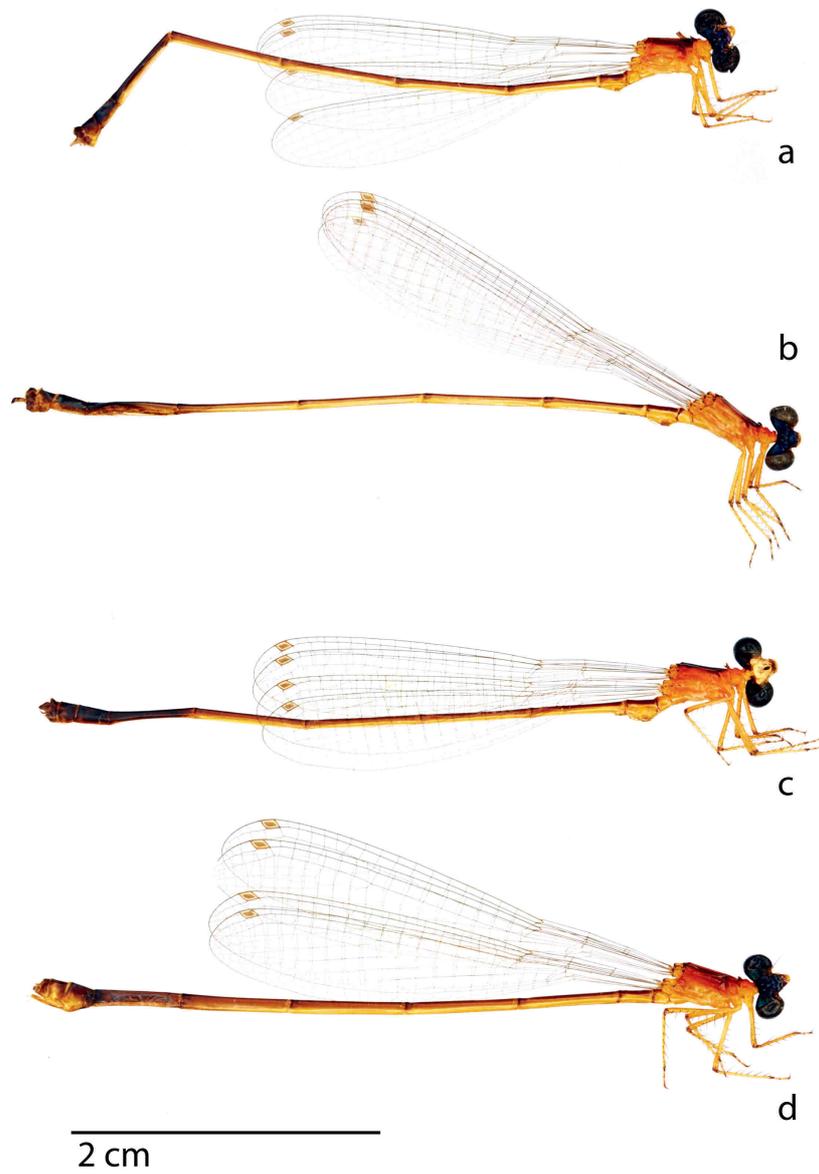


Figure 36. *Teinobasis* species: (a) *Teinobasis aquila* sp. nov., male, holotype; (b) *Teinobasis* cf. *prothoracica*, male; (c) *Teinobasis lieftincki* sp. nov., male, holotype; (d) *T. lieftincki* sp. nov., female.

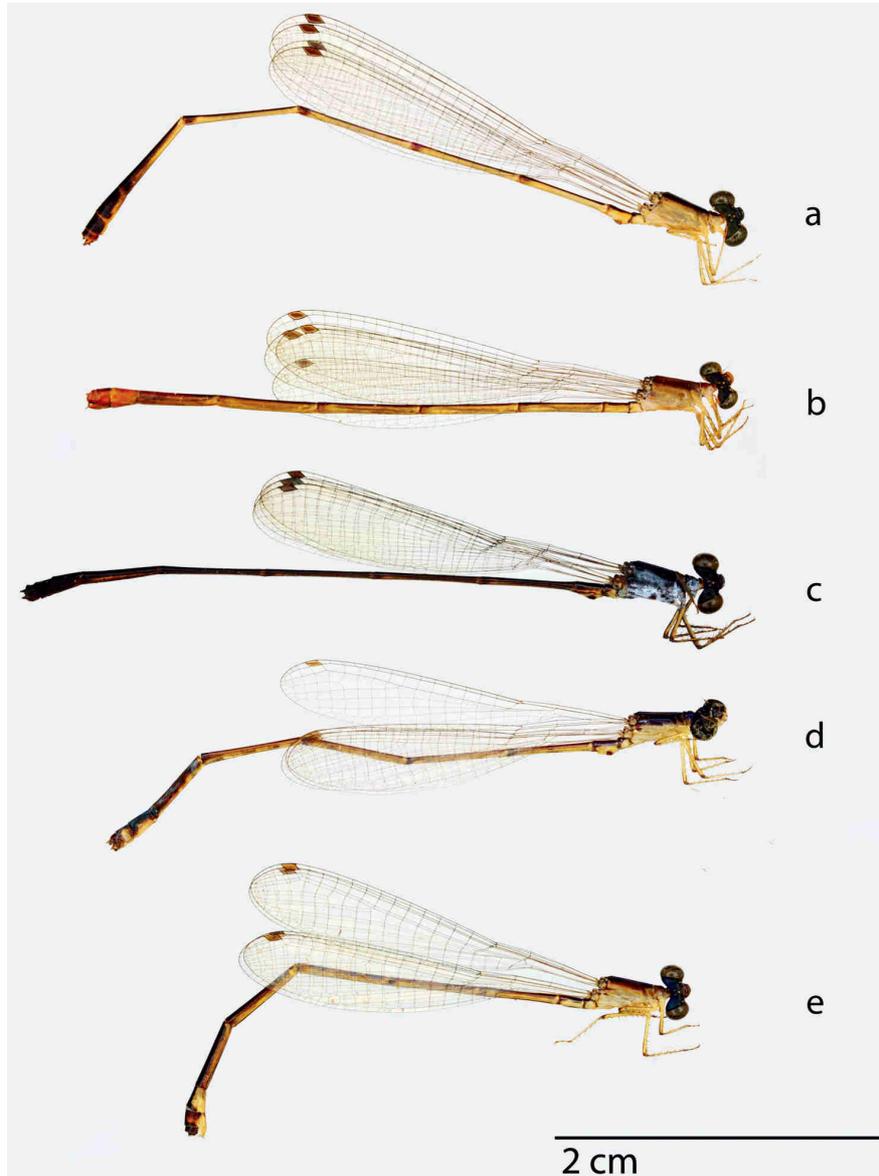


Figure 37. *Teinobasis* species: (a), *Teinobasis* cf. *superba*, male; (b) *T.* cf. *superba*, female; (c) *Teinobasis pulverulenta*, male; (d) *Teinobasis splendens* sp. nov., male, holotype; (e) *T. splendens* sp. nov., female.

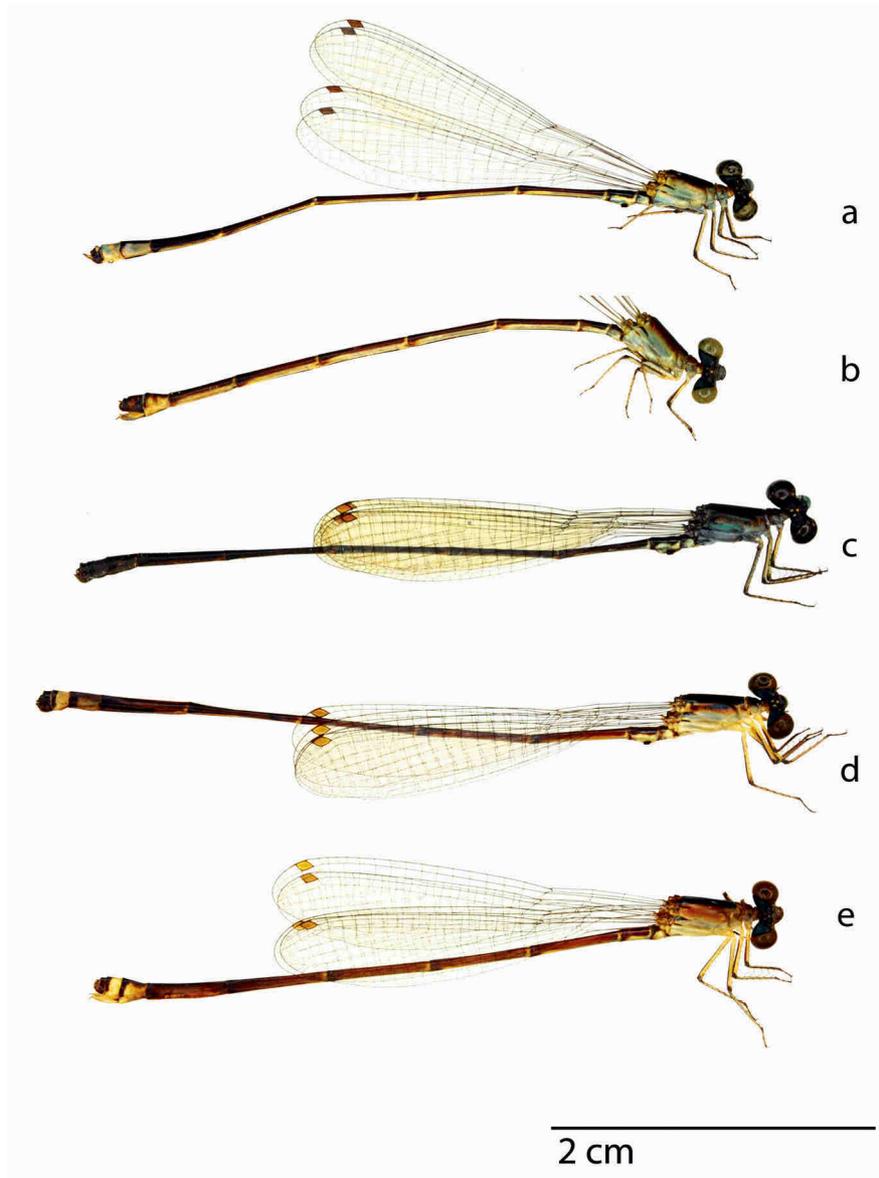


Figure 38. *Teinobasis* species: (a) *Teinobasis buwaldai*, male; (b) *T. buwaldai*, female; (c) *Teinobasis michalskii* sp. nov., male; (d) *T. michalskii* sp. nov., male, holotype; (e) *T. michalskii* sp. nov., female.

Key to the males

The species are divided into three groups based largely on readily visible characters. The combination of characters given for each species distinguishes them from all other species of *Teinobasis* from the Bird's Head Peninsula and the Raja Ampat Islands.

Thorax with extensive bright orange or reddish colour

Teinobasis rufithorax – ♂ Hw 21–22 mm. Thorax entirely orange-red, without dark middorsal stripe. Posterior lobe of pronotum not strongly modified and without lateral subtriangular wings.

Teinobasis prothoracica – ♂ Hw 25–26 mm. Thorax orange with a dark (metallic blue) middorsal stripe. Posterior lobe of pronotum not strongly modified and without lateral subtriangular processes. Superior appendages about three times as long as inferior appendages.

Teinobasis wallacei – ♂ Hw 25–26 mm. Thorax orange with a dark (metallic blue) middorsal stripe. Posterior lobe of pronotum not strongly modified and without lateral subtriangular processes. Superior appendages only slightly longer than inferior appendages.

Teinobasis lieftincki sp. nov. – ♂ Hw 25–26 mm. Thorax orange with dorsum largely dark. Posterior lobe of pronotum with lateral subtriangular flanges. Inner margin of superior appendages armed with tooth at about a third of their length.

Teinobasis aquila sp. nov. – ♂ Hw 24–25 mm. Thorax orange with dorsum largely dark. Posterior lobe of pronotum with lateral subtriangular flanges. Inner margin of superior appendages smooth and not armed with tooth.

Thorax without extensive bright orange or reddish colour, labrum largely dark (brown to black)

Teinobasis laglaizei – ♂ Hw 19–21 mm. Inferior appendages about three times as long as superior appendages, strongly curved and with apex pointing dorsally. Inferior appendages in dorsal view with inner shelf broad and rounded, convex.

Teinobasis buwaldai – ♂ Hw 21–22 mm. Inferior appendages about three times as long as superior appendages, strongly curved and with apex pointing dorsally. Inferior appendages in dorsal view with inner concave shelf.

Teinobasis species cf. *superba* – ♂ Hw 22–26 mm. Inferior appendages nearly three times as long superior appendages, not strongly curved and with apex pointing apically.

Teinobasis splendens sp. nov. – ♂ Hw 19–20 mm. Inferior appendages about as long as, or slightly shorter than, superior appendages. Dorsal appendix of S10 U-shaped with the branches parallel and straight.

Teinobasis pulverulenta – ♂ Hw 23 mm. Inferior appendages about as long as or slightly shorter than superior appendages. Dorsal appendix of S10 shaped like a bull's head with the horns directed obliquely outward and bowed.

Thorax without extensive bright orange or reddish colour, labrum largely pale (blue or yellow)

Teinobasis micans – ♂ Hw 22–25 mm. Inferior appendages about as long or slightly shorter than superior appendages. Labrum yellow.

Teinobasis michalskii sp. nov. – ♂ Hw 21–22 mm. Inferior appendages clearly longer than superior appendages. Labrum blue.

Acknowledgements

Yvonne van Nierop kindly assisted with the work in the Naturalis Biodiversity Center, Leiden, The Netherlands (RMNH).

References

- FRODIN D.G. 2007. Biological exploration of New Guinea. In: Marshall A.J. & Beehler B. (Eds), The ecology of Papua. The Ecology of Indonesia Series VI: 255-266. Periplus Editions, Hong Kong
- GASSMANN D. 1999. Taxonomy and distribution of the inornata species-group of the Papuan genus *Idiocnemis* Selys (Odonata: Zygoptera: Platycnemididae). *Invertebrate Taxonomy* 13: 977-1005
- GASSMANN D. 2000. Revision of the Papuan *Idiocnemis bidentata*-group (Odonata, Platycnemididae). *Zoologische Mededelingen* 74: 325-402

- KAIZE J. & KALKMAN V.J. 2011. Records of dragonflies (Odonata) from Kabupaten Asmat and Kabupaten Mappi (Papua, Indonesia). *Suara Serangga Papua* 5: 99-107
- KALKMAN V.J. & ORR A.G. 2012. The Australian monsoon tropics as a barrier for exchange of dragonflies (Insecta: Odonata) between New Guinea and Australia. *Hydrobiologia* 693: 55-70
- KALKMAN V.J. & ORR A.G. 2013. Field guide to the damselflies of New Guinea. *Brachytron* 15: 3-120
- LIEFTINCK M.A. 1935. The dragonflies (Odonata) of New Guinea and neighbouring islands. Part III. Descriptions of new and little known species of the families Megapodagrionidae, Agrionidae and Libellulidae (Genera *Podopteryx*, *Argiolestes*, *Papua-grion*, *Teinobasis*, *Huonia*, *Synthemis*, and *Procordulia*). *Nova Guinea* 17: 203-300
- LIEFTINCK M.A. 1949. The dragonflies (Odonata) of New Guinea and neighbouring islands. Part VII. Results of the Third Archbold expedition 1938–1939 and of the Le Roux expedition 1939 to Netherlands New Guinea (II. Zygoptera). *Nova Guinea* (NS) 5: 1-271
- MICHALSKI J. 2012. A manual for the identification of the dragonflies and damselflies of New Guinea, Maluku, & the Solomon Islands. Kanduanum Books, Morristown, NJ
- RIS F. 1915. Neuer Beitrag zur Kenntnis der Odonaten-Fauna der Neu-Guinea-Region. *Nova Guinea, Zoologie* 13: 81-131
- VAN TOL J. 2007. The Platystictidae of the Moluccas and Misool (Odonata). *Deutsche entomologische Zeitschrift* 54: 3-26
- WATSON J.A.L. 1967. An analysis of *Trapezostigma eurybia* (Selys, 1878) and related Indo-Australian species. *Nova Guinea, Zoology* 36: 377-400